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Grading Permit No. 5416

B9904063

APR 19 [redacted]



KALAMA VALLEY SUBDIVISION UNIT 2-A
PRELIMINARY SOIL REPORT

MAUNALUA, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 3-9-10: 15 & 18



To:
KAISER-AETNA

**WALTER LUM ASSOCIATES, INC.**
CIVIL, STRUCTURAL, SOILS ENGINEERS

APRIL 13, 1972

**WALTER LUM ASSOCIATES, INC.**
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
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April 13, 1972

KAISER-AETNA
P. O. Box 7534
Honolulu, Hawaii 96825

Gentlemen:

Subject: Kalama Valley Subdivision Unit 2-A
Preliminary Soil Report
(for residential development)
Maunalua, Honolulu, Oahu, Hawaii
Tax Map Key: 3-9-10: 15 & 18

In accordance with your request, soil explorations were made to determine general soil conditions at the proposed residential development site for Kalama Valley Subdivision Unit 2-A at Maunalua, Honolulu, Oahu, Hawaii.

Surface soils at the site may be generally described as "CH" clays mixed with cobbles and boulders. The surface clay layers were generally deeper in the eastern section of the site. Lava rock was encountered in the drill holes at about 3 to 15 ft from the surface.

Cuts along the eastern part of the site will be made partially thru "CH" clays with cobbles and boulders and partially thru lava rock. Slope adjustments may be required depending upon the type of material encountered out in the field.

For light residential structures, conventional slab-on-ground construction may be used where low expansion soils are within the top 2 ft of finish grade, and modified foundation designs will be required where expansive soils are encountered near the finish grades.

Earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

This report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

# C O N T E N T S

KALAMA VALLEY SUBDIVISION UNIT 2-A
PRELIMINARY SOIL REPORT

MAUNALUA, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 3-9-10: 15 & 18

## SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for residential development for the proposed Kalama Valley Subdivision Unit 2-A at Maunalua, Honolulu, Oahu, Hawaii.

This report includes field exploration, laboratory tests and general recommendations for site grading and residential foundation design.

## PRELIMINARY FIELD EXPLORATION

Five exploratory borings and two open pits were made at the site. The locations of these borings and open pits are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on the boring logs. Also attached are logs of borings previously made for "Kalama Valley Off-Site Improvements" and "Bridge Site No. 1."

Borings were made with 4-in. diameter augers using carbide drag bits. Open pits were made with a caterpillar D-9 dozer with a ripper. Soil samples were recovered with 2 and 3-in. thin wall tube and 2-in. standard split spoon samplers driven with a 140-lb hammer falling 30 inches.

## LABORATORY TESTS

Laboratory tests included: natural density, water content, unconfined compression, torvane shear, Atterberg limit, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA and IB.

## SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory test data, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

## GENERAL SITE CONDITIONS

The project site is located on the eastern side of the floor of Kalama Valley, about 800 ft south of Kalama Crater. The existing ground generally slopes upward from Kalama Stream west to east toward the foot of Kalama Ridge that forms the east boundary of Kalama Valley.

Prior to the field exploration, grass, brush and keawe trees were removed. Access roads cross the site and scattered stockpiles of soil and rubbish were noted on the site.

## INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils encountered in the borings can be generally described as follows:

### Eastern Boundary

The open pits and borings along the eastern boundary or lower slopes of Kalama Ridge generally indicated talus material, "CH" soils, with cobbles and boulders to about 3.5 to 12 ft underlain by silty sand and rock to about 15 to 17 ft, the depths drilled.

### Valley Floor

The borings in the floor of the valley generally indicated a surface layer of brown clay ("CH" soils) with gravel and boulders to about 3 to 7.5 ft underlain with lava rock.

Gypsum crystals were noted in some of the soil samples recovered.

Water was not noted in the drill holes during the field exploration.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

## DISCUSSION AND RECOMMENDATIONS

The proposed plan is to grade the site for residential subdivision development.

Fills up to about 6 ft in height are proposed along the central section of the development.

Along the eastern boundary, cut slopes are proposed along the lower slopes of the ridge. At the lower end of natural drainage paths from the upper slopes, deep deposits of expansive "CH" clays may be encountered. Slope adjustments and subdrains may be required in these deposits.

The site should be cleared and grubbed, drained and localized soft spots removed prior to construction of fills.

### Site Grading

The on-site surface soils are generally clayey, adobe or "CH" soils, and should generally be placed in fills away from the face of slopes and preferably outside of building pads. Silty or sandy soils and decomposed rocks or select borrow soils should be used to construct the outer sections of the slopes and, if practicable, the upper 2 to 3 ft of fills for roadways, parking areas and building pads.

If boulders are to be used to construct fills, they should generally be placed at the toe of slopes and outside the building areas.

The construction of fills should be done in accordance with Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein. The following may be used as a guide:

1. The area should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

2. Topsoil, stockpiled soils and loose boulders should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

   Soft pockets and pockets of unsuitable material should be excavated and backfilled with compacted select on-site soils.

3. Hard surfaces along existing access roads should be scarified and recompacted to match the density of the surrounding soils.

4. Low spots in dips or natural drainageways should be drained and soft spots removed. Subdrains should be placed in a herringbone pattern along the bottom before the placement of fills.

   The lower 2± ft of fill over drainageways should be constructed with fairly well-graded granular material, 6-in. maximum size with less than about 15% passing the No. 200 sieve.

5. Where fills are proposed on sidehill areas, the ground at the toe of the slope should be benched to a generally level condition. As the fill is brought up, it should be continually keyed into the stiff natural ground by cutting steps into the slopes and compacting the fills into these steps.

6. Fills should be constructed in approximately level layers starting at the lower end and working upward.

7. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

8. If boulders are used in the construction of fills, they should be placed along the toe of the fill slopes. The subgrade should be shaped to drain and covered with a layer of filter material. Boulders may then be placed on the filter layer. The void spaces between boulders should be filled with granular material. A blanket of filter material should be placed against the boulder fill before placing earth fills behind the boulders. See sketch on Figure 3.

Slopes

Where plastic clays, "CH", are encountered, slope ratios generally about 3 horizontal to 1 vertical or flatter should be used; otherwise, reconstruction of the outer portions of the slope may be considered. Where the face of the fill slope is adobe, the slope height should generally be kept less than 6 ft. See Figure 1.

In silty or granular soils, slopes of about 2 horizontal to 1 vertical or flatter may be used.

Where lava rock with clinker pockets are encountered, slope ratios of about 1-1/2 horizontal to 1 vertical may be used.

For low cuts in fairly continuous lava rock formations, slope ratios of about 1 horizontal to 1 vertical may be used.

The cuts along the eastern boundary will be made partially thru "CH" clays with cobbles and boulders and partially thru lava rock. Allowances should be made for slope adjustments in this section depending on the type of material encountered and particularly if seepage zones, soft spots or expansive soil pockets are encountered in localized areas.

For protection against erosion, water should be diverted away from slopes by berms or ditches whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Foundations

If earthwork is carried out as recommended, the stiff natural ground and well-constructed fills should develop adequate bearing values to support the proposed light, short-span residential structures.

Slab-on-ground construction and post-and-beam construction may be used where silty or granular soils, or select borrow soils occur within the top 2 ft of finish grade.

If slab-on-ground construction is used on clay ("CH" soils), the footing excavations around the perimeter of the building should extend 18 in. below the bottom of the footing and backfilled with compacted, select coral or an equivalent material. The base course should be placed and wetted down 48 hours before the placement of slab on ground. See Figure 2.

Post-and-beam construction may be used where clayey soils, "CH", are near finish grade. To minimize the effects of heave and shrinkage of "CH" soils, excavations for the foot blocks should be made about 2 ft deep and about 1 ft 6 in. square or round and backfilled with compacted, select coral or an equivalent material. The foot blocks may be placed on top of the coral. See Figure 2.

The select coral should be well graded from 3/4-in. to dust sizes with about 25% or more passing the No. 200 sieve.

The following may be used as a guide for foundation design:

1. Bearing values for a given soil vary with the size and depth of footings. For light residential structures, bearing values of about 1500

p.s.f. on compacted fill and 2000 p.s.f. on stiff natural ground may be used.

2. Soft spots or pockets of loose material encountered in footing excavations or below a building area should be excavated and replaced with compacted select on-site soils or select borrow materials.

3. Concrete slab on ground should be placed over a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size. If practicable, the subgrade should be kept higher than the lot or general finish grade. The subgrade should be compacted and shaped to a level surface or to drain.

4. Buildings and structures should be placed about 15 ft from the tops of slopes. This distance may be reduced for lower slope heights, e.g., 10 ft for 10-ft high slopes, but in no case closer than 5 ft from the top of a slope.

5. Construction of retaining wall on slopes should generally be avoided.

6. Good surface drainage away from building foundations should be maintained and the site should be graded to prevent the ponding of water.

Underground Utilities

Underground utilities should be placed after the fills are constructed.

Utility line trenches should be daylighted to drain water, particularly in the upper (eastern) sections.

Flexible connections should be used.

Roadway

In general, a rough estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course.
3. Select borrow - 6-in. select borrow.
   (0 in. over rocky ground)
4. Borrow - 24-in. borrow over clay, "CH" soils (CBR < 2, Expansion > 7).

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field as ground conditions are exposed at subgrade levels.

In fill areas, the use of select soils within the top 3 ft of finish grade may be considered to reduce the thickness or eliminate the select borrow or borrow courses.

It is recommended that the pavement subgrade be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels through the walls of catch basins.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

# PROPOSED SPECIFICATION FOR EARTHWORK

## KALAMA VALLEY SUBDIVISION - UNIT 2-A

### General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

### Clearing, Grubbing and Preparing Areas to be Filled

Vegetation and rubbish shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Stockpiled, nested and loose boulders shall be removed and the area stripped to stiff ground or scarified and recompacted to a fairly level condition before the placement of fills.

Hard surfaces along the existing access roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil before the placement of fills.

Where fills are proposed in sidehill areas and gullies, loose material along the bottom and the sides shall be stripped down to stiff natural ground before the placement of fills. New fills shall be keyed into the stiff natural ground.

Subdrains shall be placed along the bottom of natural drainageways before the construction of fills. The final locations of subdrains shall be determined in the field after clearing and grubbing.

Where fills are made on sloping areas steeper than 5 horizontal to 1 vertical, the ground at the toe of the slope shall be benched to a generally level condition. As the fill is brought up, it shall be continually keyed into the stiff natural ground by the cutting of steps into the hillside and compacting the fill into these steps. Ground slopes which are flatter than 5 horizontal to 1 vertical shall be benched when considered necessary by the Soil Engineer.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Adobe or "CH" clay soils shall generally be placed in fills away from the face of slopes and outside of building pads.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly

and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed

surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Excavation

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots, seepage water or expansive clay pockets are encountered, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.

# BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

## Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu
Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 27 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date JAN. 17, 1972

Field Party GLORY, RADOVICH

Type of Boring AUGER (MOBILE B-40) Diam. 4"

Elev. * 51'± Datum —

Drill Bit T.C. DRAG

Water Level NOT NOTICED

Time —

Date 1-17-72

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | * ELEV.: 51'± | 0 | | | | | | | | |
| | SILTY SAND W/GRAVEL & MUDROCK | | | 27-A | - | 28 | - | - | - | 30/2" |
| (SM) | DENSE, GRAY SILTY SAND W/CEMENTED SAND | 5 | | | | | | | | |
| | LAVA ROCK | | | 27-B | - | NO RECOVERY | | - | | 50/0" |
| | | 10 | | 27-C | - | NO RECOVERY | | - | | 50/0" |
| | END OF BORING @ 10.5' | | | | | | | | | |

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

KALAMA VALLEY UNITS 2,3,5

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

OPEN PIT

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu
Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight: —
Drop: —

SAMPLER: —

~~BORING~~ NO. PT Sheet No. ____ of ____

Driller: KAISER H.-KAI DEV. CO. Date: JAN. 11, 1972

Field Party: MEYER (W. LUM ASSOC., INC.)

Type of Boring: OPEN PIT W/D-9 DOZER Diam.: 15' x 8'

Elev.: 56'± * Datum: —

Drill Bit: —

| | | | | |
|---|---|---|---|---|
| Water Level | NOT NOTICED | | | |
| Time | — | | | |
| Date | 1-11-72 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEVATION = 56'± * | 0 | | | | SURFACE: | | LL: 84 PL: 28 | | |
| CH | BROWN CLAY W/ BOULDERS | 5 | | | | | | | | |
| MH | TAN & ORANGE, FINE SANDY SILT | | | - | - | 32 | - | LL: 55 PL: 41 | | |
| (SM) | BROWN FINE, SILTY SAND | | | - | - | 10 | - | - | - | |
| (SM) | DARK GRAY, W/WHITE SILTY SAND | 10 | | | | 14 | | | | |
| | BOTTOM OF PT @ 10' | | | | | | | | | |

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu
Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"S - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 28 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 17, 1972
Field Party GLORY, RADOVICH
Type of Boring AUGER (MOBILE B-40) Diam. 4"
Elev. * 65'± Datum —
Drill Bit T.C. DRAG

| | | | | |
|---|---|---|---|---|
| Water Level | NOT NOTICED | | | |
| Time | — | | | |
| Date | 1-17-72 | | | |

| Unified Soil Classification | DESCRIPTION * ELEV. = 65'± ? | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test; 2" O.D. THIN WALL TUBE SAMPLER; N (Blows per foot) 0 10 20 30 40 BLOWS/0.5' |
|---|---|---|---|---|---|---|---|---|---|---|
| | CLAY (ADOBE), COBBLES & BOULDERS | 0 | | | | | | | | |
| CH | STIFF, DARK BROWN CLAY (ADOBE) W/GYPSUM | 5 | 2"SS | 28-A | — | 45 | L.L.= 84 P.I.= 27 | — | — | 30/.2' |
| (MH) | STIFF, TAN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK GRAY, SILTY SAND | 10 | 2"S | 28-B | — | 35 37 | — | — | — | 6/.5' 20/.2' |
| | LAVA ROCK | 15 | | | | | | | | |
| | END OF BORING @ 17' | | | | | | | | | |

*ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

B1

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

OPEN PIT

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu
Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight: 10# SLEDGE HAMMER
Drop: —

SAMPLER: 2" O.D. THIN WALL TUBE

~~BORING~~ NO. 28 Sheet No. ____ of ____

Driller: KAISER H.-KAI DEV. CO. Date: JAN. 11, 1972

Field Party: MEYER (W. LUM ASSOC., INC.)

Type of Boring: OPEN PIT W/D-9 Diam.: 15' x 12'

Elev.: 74' ± * Datum: —

Drill Bit: —

| | | | | | |
|---|---|---|---|---|---|
| Water Level | NOT NOTICED | | | | |
| Time | — | | | | |
| Date | 1-11-72 | | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40 | 10# SLEDGE HAMMER BLOWS/0.5' |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 74±' | 0 | | | | | | | | | |
| CH | DARK BROWN CLAY W/ BOULDERS & GYPSUM | 5 | | PIT 28-A | - | 37<br>38 | - | - | - | | 4/5' 10/5' |
| | | | | | - | 38<br>TORVANE @ 35 | - | 6.0' | 1700 | | |
| | | | | | - | TORVANE @ 30 | - | 8.0 | 1200 | | |
| | | 10 | | | | 39 | LL: 72<br>PL: 28 | | | | |
| (ML) | LIGHT BROWN CLAYEY SILT & DECOMPOSED ROCK<br>BOTTOM OF PIT @ 13.0' | | | | - | 31 | - | - | - | | |

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu
Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 29 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 17, 1972
Field Party MEYER, KAKU
Type of Boring AUGER (AUGER ACE) Diam. 4"
Elev. * 54'± Datum —
Drill Bit T.C. DRAG

| | | | | |
|---|---|---|---|---|
| Water Level | NOT NOTICED | | | |
| Time | — | | | |
| Date | 1-17-72 | | | |

| Unified Soil Classification | * DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEVATION = 54'± | 0 | | | | | | | | |
| CH | BROWN SILTY CLAY W/ GRAVEL, COBBLE, CORAL & SAND<br>STIFF MOTTLED BROWN CLAY W/DECOMPOSED ROCK | | | 29-A | — | 15 | L.L.=79<br>P.L.=33 | — | | 30/3' HAMMER BOUNCES |
| | | 5 | | 29-B | — | — | — | — | — | 40/2' HAMMER BOUNCES |
| | DENSE LAVA ROCK (PUKA-PUKA) | | | | | | | | | |
| | | 10 | | 29-C | — | — | — | — | — | 40/1" HAMMER BOUNCES |
| | | 15 | | | | | | | | |
| MH | STIFF BROWNISH RED CLAYEY SILT W/TRACES OF SAND & DECOMPOSED ROCK & CLAY POCKETS<br>END OF BORING @ 16.5' | | | 29-D | + | 43 | L.L.=74<br>P.L.=46 | — | | 41 |

* ELEVATION ESTIMATED FROM TOPO MAP PARK ENGINEERING, INC.

KALAMA VALLEY UNIT 2, 3, 5

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu

Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 30 Sheet No. ____ of ____

Driller W.LUM ASSOC., INC Date JAN. 18, 1972

Field Party ISHAZAKI, GLORY, RADOVICH

Type of Boring AUGER (MOBILE B-40) Diam. 4"

Elev. * 76'± Datum —

Drill Bit J.C. DRAG

| | | | | |
|---|---|---|---|---|
| Water Level | NOT NOTICED | | | |
| Time | — | | | |
| Date | 1-18-72 | | | |

| Unified Soil Classification | * DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEVATION = 76'± | 0 | | | | | | | | |
| | BROWN CLAY W/ SAND, GRAVEL & ORGANIC MATTER | | | | | | | | | |
| | DENSE LIGHT REDDISH BROWN SILTY SAND W/ CEMENTED SAND | 5 | 2"SS | 30-A | = | 50 | - | - | - | G4 |
| | OLIVE SILTY SAND | | | | | | | | | |
| | LAVA ROCK | 10 | 2"SS | 30-B | = | NO RECOVERY - | | | | 20/00' HAMMER BOUNCES |
| | END OF BORING @ 10.0' | | | | | | | | | |

* ELEVATION ESTIMATED FROM TOPO MAP PARK ENGINEERING, INC.

BY

KALAMA VALLEY - UNIT 2, 3, 5

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY SUBDIVISION UNITS 2, 3 AND 5

LOCATION: Kalama Valley, Maunalua, Oahu

Tax Map Key: 3-9-10, 15 & 18

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"S - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 31 Sheet No. ____ of ____

Driller: W.LUM ASSOC, INC. Date: JAN. 17, 1972

Field Party: MEYER, KAKU

Type of Boring: AUGER (ACKER ACB) Diam.: 4"

Elev.: 68'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: —

Date: 1-17-72

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Wet Dens. P.C.F. | Water Cont. % | Dry Dens. P.C.F. | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40 | PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 68'± * | 0 | | | | | | | | | |
| CH | BROWN CLAY W/ GRAVEL, COBBLE, SAND & ROOTS | | 2"S | 31-A | 97 | 34 | 73 | 7170 | — | | 2/.5', 4/.5' |
| | MEDIUM BROWN CLAY W/ ROOTS & TRACES OF GRAVEL | | | | | LL: 63 PL: 29 | | | | | |
| | | 5 | 2"SS | 31-B | — | NO RECOVERY | | | — | | 40/.0' HAMMER BOUNCES |
| | LAVA ROCK | 10 | 2"SS | 31-C | — | — | — | — | — | | 49/.1' HAMMER BOUNCES |
| | END OF BORING @ 15.0' | 15 | 2"SS | 31-D | — | NO RECOVERY | | | — | | 40/.0' HAMMER BOUNCES |

*ELEVATION ESTIMATED FROM TOPO MAP PARK ENGINEERING, INC.

KALAMA VALLEY SUBDIVISION - UNIT 2.A

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

| | | | | |
|---|---|---|---|---|
| BORING NO. | OPEN PIT 27 | OPEN PIT 27 | 28 | OPEN PIT 28 |
| SAMPLE NO. | | | A | |
| DEPTH BELOW SURFACE | SURFACE | 6'-7' | 5'-5.7' | 8' |
| DESCRIPTION | BROWN CLAY W/BOULDERS | TAN & ORANGE FINE SANDY SILT | DARK BROWN CLAY W/GYPSUM | DARK BROWN CLAY W/BOULDERS & GYPSUM |
| GRAIN-SIZE ANALYSIS (% Passing) Sieve | | | | |
| 1" | | | | |
| 1/2" | | | | |
| #4 | | | | |
| #10 | | | | |
| #20 | | | | |
| #40 | | | | |
| #100 | | | | |
| #200 | | | | |
| ATTERBERG LIMITS | | | | |
| Air Dried or Natural | NATURAL | NATURAL | NATURAL | NATURAL |
| Liquid Limit | 84 | 55 | 84 | 72 |
| Plastic Limit | 28 | 41 | 27 | 28 |
| Plasticity Index | 56 | 14 | 57 | 44 |
| Dilatancy | | QUICK | | NONE |
| Toughness | HIGH | SLIGHT-MED. | HIGH | HIGH |
| Dry Strength | HIGH | SLIGHT-MED. | HIGH | HIGH |
| UNIFIED SOIL CLASSIFICATION | CH | MH | CH | CH |
| APPARENT SPECIFIC GRAVITY | | | | |
| EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.) | | | | |
| Molding Moisture, % | 25.0 | | | |
| Molding Dry Density, P.C.F. | 97.8 | | | |
| Swell upon saturation, % | 10.5 | | | |
| CBR at 0.1" Penetration | 1.3 | | | |
| MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method___) | | | | |
| Dry to Wet or Wet to Dry | | | | |
| Max. Dry Density (P.C.F.) | | | | |
| Optimum Moisture (%) | | | | |

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-18-72 By BT

KALAMA VALLEY SUBDIVISION - UNITS 2-A

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

| | | | | |
|---|---|---|---|---|
| BORING NO. | 29 | 29 | 31 | |
| SAMPLE NO. | A | D | A | |
| DEPTH BELOW SURFACE | 2'-2.8' | 15'-16.5' | 1'-2' | |
| DESCRIPTION | MOTTLED BROWN CLAY W/DECOMP. ROCK | BROWNISH-RED CLAYEY SILT W/TRACES OF DECOMP. ROCK & CLAY POCKETS | BROWN CLAY W/ROOTS & TRACES OF GRAVEL | |
| GRAIN-SIZE ANALYSIS (% Passing) | | | | |
| Sieve 1" | | | | |
| 1/2" | | | | |
| #4 | | | | |
| #10 | | | | |
| #20 | | | | |
| #40 | | | | |
| #100 | | | | |
| #200 | | | | |
| ATTERBERG LIMITS | | | | |
| Air Dried or Natural | NATURAL | NATURAL | NATURAL | |
| Liquid Limit | 79 | 74 | 63 | |
| Plastic Limit | 33 | 46 | 29 | |
| Plasticity Index | 46 | 28 | 34 | |
| Dilatancy | NONE | MED.-QUICK | NONE | |
| Toughness | HIGH | MED.-HIGH | HIGH | |
| Dry Strength | HIGH | MEDIUM | HIGH | |
| UNIFIED SOIL CLASSIFICATION | CH | MH | CH | |
| APPARENT SPECIFIC GRAVITY | | | | |
| EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.) | | | | |
| Molding Moisture, % | | | | |
| Molding Dry Density, P.C.F. | | | | |
| Swell upon saturation, % | | | | |
| CBR at 0.1" Penetration | | | | |
| MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___) | | | | |
| Dry to Wet or Wet to Dry | | | | |
| Max. Dry Density (P.C.F.) | | | | |
| Optimum Moisture (%) | | | | |

REMARKS:

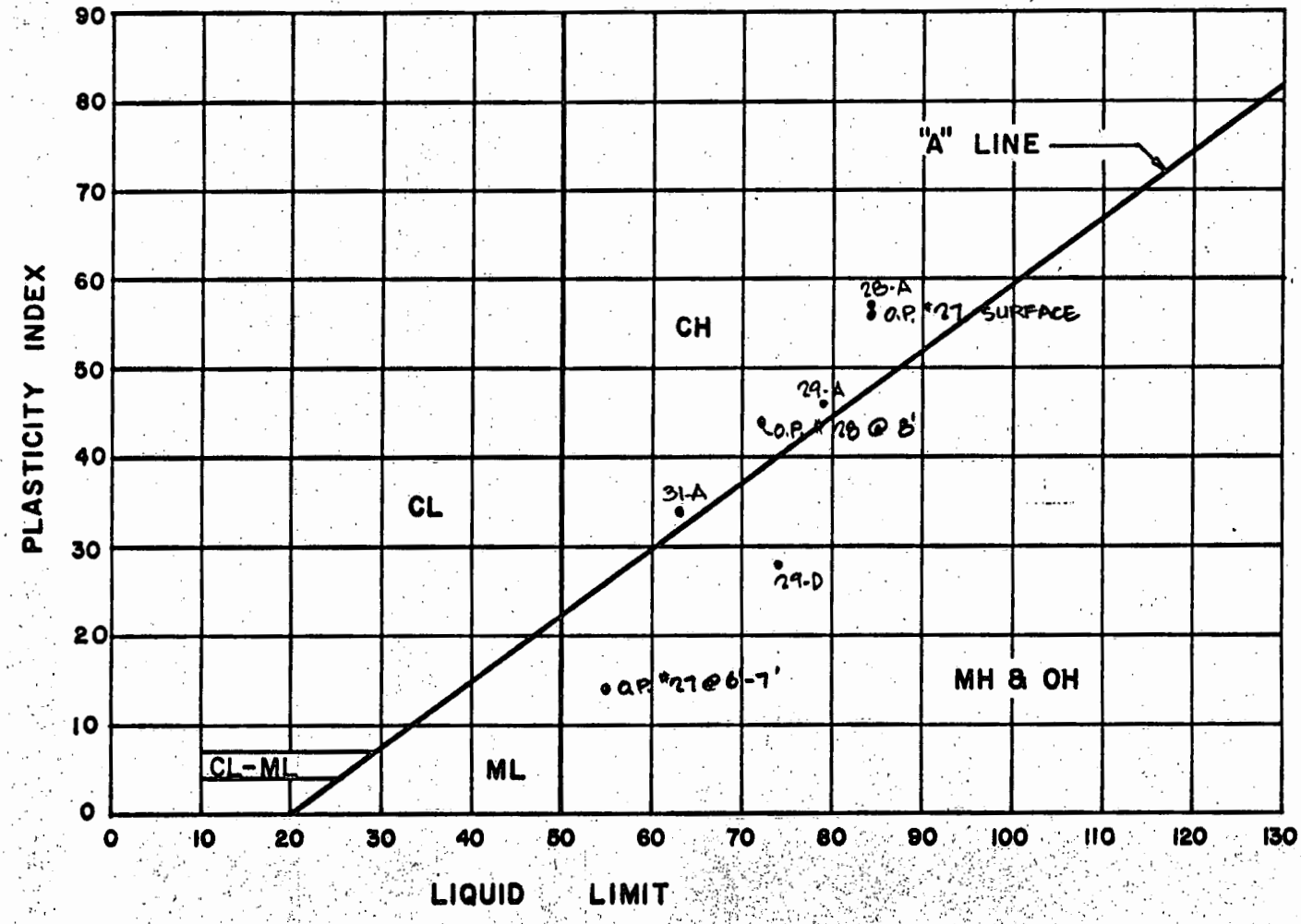
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-18-72 By BT

# PLASTICITY CHART

PROJECT: KALAMA VALLEY SUBDIVISION - UNITS 2-A

LOCATION: MAUNALUA, OAHU, HAWAII




NOTE:

O.P. - INDICATES OPEN PIT NOS.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 3-18-72 BY BT

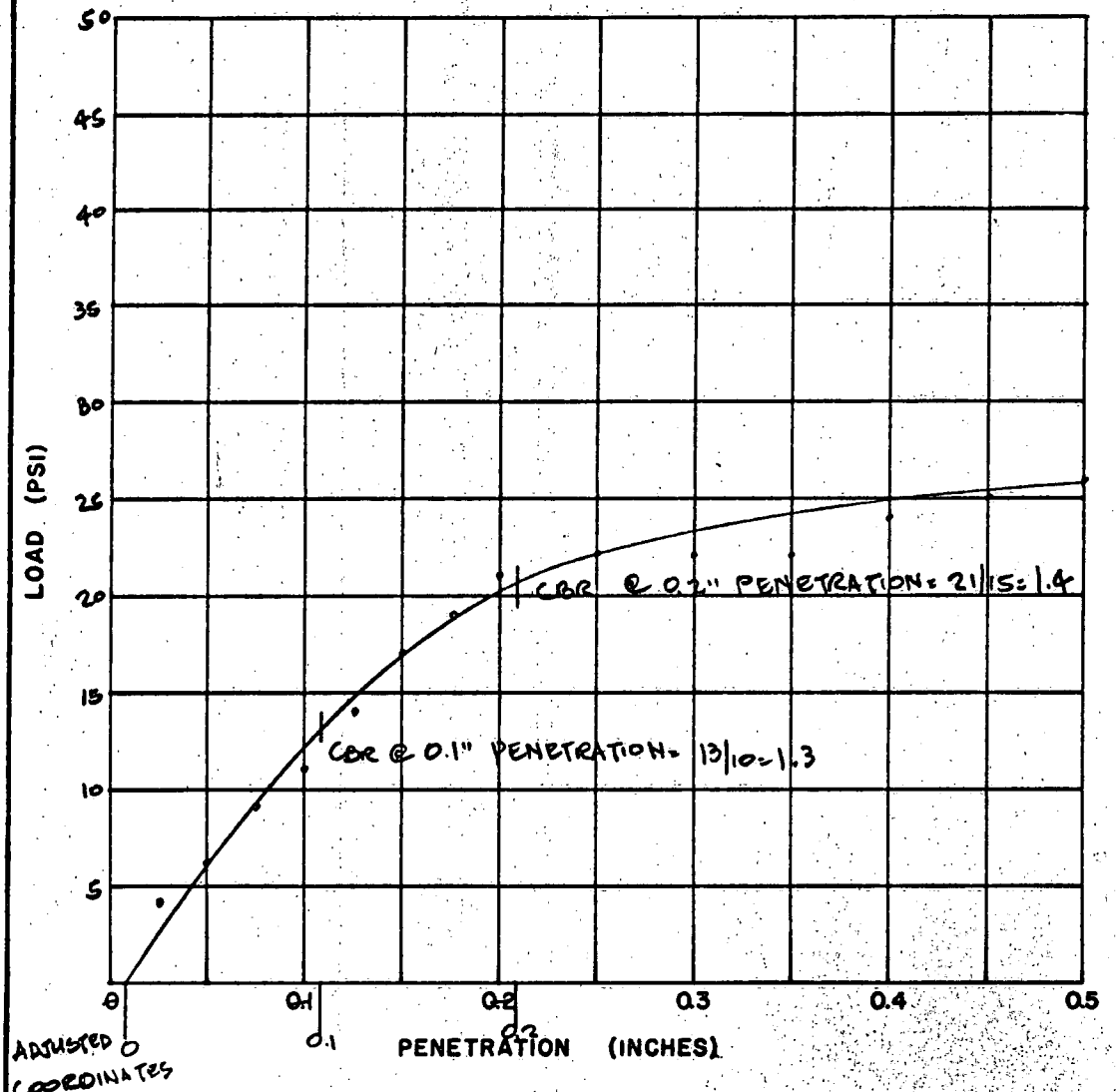
# CBR TEST

PROJECT: KALAMA VALLEY SUBDIVISION - UNIT 2-A

LOCATION: KALAMA VALLEY, MAUNALUA, OAHU

SAMPLE NO: OPEN PIT 27 SURFACE

SAMPLE DESCRIPTION: BROWN CLAY W/BOULDERS




CBR PENETRATION DATA

| PENETRATION (INCHES) | LOAD (LBS.) | LOAD (PSI) |
|---|---|---|
| 0.025 | 11 | 4 |
| 0.050 | 18 | 6 |
| 0.075 | 27 | 9 |
| 0.100 | 33 | 11 |
| 0.125 | 41 | 14 |
| 0.150 | 50 | 17 |
| 0.175 | 56 | 19 |
| 0.200 | 62 | 21 |
| 0.250 | 67 | 22 |
| 0.300 | 67 | 22 |
| 0.350 | 65 | 22 |
| 0.400 | 72 | 24 |
| 0.450 | 74 | 25 |
| 0.500 | 78 | 26 |

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

## TEST RESULTS:

MOLDING MOISTURE, %. 25.0

MOLDING DRY DENSITY, P.C.F. 97.8

CBR @ 0.1" PENETRATION 1.3

DAYS SOAKED 4

DATE 1-21-72 BY MO

DATE 1-20-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

# LOGS OF BORINGS

FROM

"KALAMA VALLEY OFF-SITE IMPROVEMENTS"

AND

"BRIDGE SITE NO. 1"

KALAMA VALLEY

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" SS: 2" STANDARD SPLIT SPOON
"AX" - AX DOUBLE TUBE CORE BARREL

BORING NO. 1 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date AUG. 9, 1971

Field Party MAESHIRO, KAKU

Type of Boring (ACKER ACE) AUGER & CORING Diam. 4"

Elev. 43' ± * Datum —

Drill Bit T.C. DRAG & T.C. CORING

| | | | | | |
|---|---|---|---|---|---|
| Water Level | NOT NOTICED | | | | |
| Time | — | | | | |
| Date | 8-9-71 | | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 43' ± 7 '* | 0 | | | | | | | | |
| (CH) | STIFF, BROWN CLAY W/ GRAVEL & ROOTS | | 2"SS | 1-A | — | 24 | — | — | — | |
| | AUGER W/ T.C. DRAG | 5 | | | | | | | | |
| | | | "AX" | RUN #1 | | CORED: 5.0' RECOV.: 4.5' | | | | |
| | LAVA ROCK (PUKA PUKA ROCK) | 10 | | | | | | | | |
| | | | "AX" | RUN #2 | | CORED: 5.0' RECOV.: 4.5' | | | | |
| | CORING W/ T.C. CORING | 15 | | | | | | | | |
| | END OF BORING @ 15' | | | | | | | | | |

* ELEVATION ESTIMATED FROM QUEEN'S BEACH DEVELOPMENT TOPO MAP

KALAMA VALLEY

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: "AX" - AX DOUBLE TUBE CORE BARREL
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date AUG. 4, 5, 1971

Field Party MAESHIRO, TSUKAZAKI

Type of Boring AUGER (ACKER ACE) & ROTARY Diam. 4"

Elev. 46'± * Datum —

Drill Bit T.C. DRAG, ROLLER ROCK & DIAMOND CORING

| Water Level | NOT NOTICED | | | | |
|---|---|---|---|---|---|
| Time | — | | | | |
| Date | 8-5-71 | | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. ≈ 46' ± 7' * | 0 | | | | | | | | |
| CORING/DIAMOND AUGER/T.C. DRAG | STIFF, REDDISH BROWN SILTY CLAY W/COBBLES | | 2"SS | 2-A | - | 28 | - | - | - | 30/4' |
| | ROCK OR BOULDER | 5 | 2"SS "AX" | 2-B | - | - | - | - | - | 50/2' HAMMER BOUNCES |
| ROTARY/ROLLER BIT | | | | 2-C | CORED: 0.8' RECOV.: 0.3' | | | | | |
| | | 10 | | | | | | | | |
| | END OF BORING @ 11' | | 2"S | 2-D | - | NO | RECOVERY | - | - | 50/0' HAMMER BOUNCES |

*ELEVATION ESTIMATED FROM QUEEN'S BEACH DEVELOPMENT TOPO MAP

KALAMA VALLEY

**WALTER LUM ASSOCIATES, INC.**

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT: KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION: Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10, 15 & 18

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS: 2" STANDARD SPLIT SPOON
"BX" - BX DOUBLE TUBE CORE BARREL

BORING NO. 3 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: AUG. 10, 1971

Field Party: MAESHIRO, KAKU

Type of Boring: AUGER & ROTARY (JACKER AGE) Diam.: 4" & BX

Elev.: 56' ± * Datum: —

Drill Bit: T.C. DRAG & T.C. CORING

| Water Level | NOTE: DRILL WATER | IN HOLE | 3.5' | |
|---|---|---|---|---|
| Time | - | | | |
| Date | 8-10-71 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. ± 56' ± 7* | 0 | | | | | | | | |
| (CH) | STIFF, BROWN CLAY W/ROOTS (AUGER W/ T.C. DRAG) | | 2"SS | 3-A | - | 20 | - | - | - | |
| | | 5 | | | | | | | | |
| | LAVA ROCK (PUKA PUKA ROCK) (CORING W/ T.C. CORING) | | "BX" | RUN #1 | | CORED: 4.0' RECOV.: 3.0' | | | | |
| | | 10 | | | | | | | | |
| | | | "BX" | RUN #2 | | CORED: 4.0' RECOV.: 2.5' | | | | |
| | END OF BORING @ 13' | | | | | | | | | |

* ELEVATION ESTIMATED FROM QUEEN'S BEACH DEVELOPMENT TOPO. MAP

KALAMA VALLEY

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
"AX" - AX DOUBLE TUBE CORE BARREL

BORING NO. 4 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date AUG. 3, 1971

Field Party GLORY, TSUKAZAKI

Type of Boring AUGER & ROTARY (JACKER ACE) Diam. 4"

Elev. 62'± * Datum —

Drill Bit T.C. DRAG, ROLLER ROCK & DIAMOND CORING

| | | | | | |
|---|---|---|---|---|---|
| Water Level | NOT NOTICED | | | | |
| Time | — | | | | |
| Date | 8-3-71 | | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV.= 62'± * | 0 | | | | | | | | |
| | BROWN, CLAYEY SILT W/ SAND & GRAVEL | | | | | | | | | |
| (CH) | STIFF, GRAY, CLAY (ADOBE) | | 2"SS | 4-A | — | 24 | — | — | — | |
| (MH-CH) | STIFF, BROWN, SILTY CLAY W/TRACES OF CLAY & ROOTS | | | | | 23 | | | | |
| (CH) | BROWN, CLAY W/ ROOTS & PUKA PUKA ROCK | 5 | 2"SS | 4-B | — | 26 | — | — | — | |
| | | 10 | | | | | | | | |
| | LAVA ROCK (PUKA PUKA ROCK) | | "AX" | RUN #1 | | CORED: 5.0' RECOV.: 4.8' | | | | |
| | END OF BORING @ 15' | 15 | | | | | | | | |
| | * ELEVATION ESTIMATED FROM QUEEN'S BEACH DEVELOPMENT TOPO MAP | | | | | | | | | |

KALAMA VALLEY - MAKAI BRIDGE

**WALTER LUM ASSOCIATES, INC.**

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

BRIDGE SITE No. 1

# Boring Log

BORING NO. 5 Sheet No. ____ of ____

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS Driller W. LUM ASSOC., INC. Date NOV. 27, 29, & 30, 1971

LOCATION Maunalua, Oahu, Hawaii Field Party MAESHIRO, MAKISHI, MATTES

Tax Map Key: 3-9 Por. 10, 15, 18 Type of Boring AUGER & CORING (ACKER ACE) Diam. 4", BX, & AX

Elev. 68.5' * Datum —

HAMMER: Drill Bit T.C. DRAG & DIAMOND CORING

Weight 140#

Drop 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
BX - BX DOUBLE TUBE CORE BARREL
AX - AX DOUBLE TUBE CORE BARREL

| Water Level | NOT NOTICED | NOT NOTICED | | | |
|---|---|---|---|---|---|
| Time | — | — | | | |
| Date | 11-29-71 | 11-30-71 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 68.5' *2 | 0 | | | | | | | | |
| (MH) | MEDIUM, REDDISH BROWN CLAYEY SILT | | 2"SS | S-A | - | 22 | - | - | - | 11 BLOWS PER 0.5 FT. |
| | | 5 | 2"SS | S-B | - | 2 | - | - | - | 30/2" HAMMER BOUNCES |
| | NOV. 27 LAVA ROCK (PUKA PUKA) | 10 | 2"SS | S-C | - | - | - | - | - | 50/1" HAMMER BOUNCES |
| | | | BX | | CORED 5.0' RECOV. 3.9' | | | | | ESTIMATED FTG. DEPTH |
| | NOV. 29 | 15 | | | | | | | | APPROX. INVERT 5-13-71 |
| | | 20 | BX | | CORED 5.0' RECOV. 4.4' | | | | | |
| | | | BX | | CORED 3.5' RECOV. 2.9' | | | | | |
| | NOV. 30 | 25 | BX | | CORED 2.0' RECOV. 1.2' | | | | | |
| | | | AX | | CORED 4.0' RECOV. 2.0' | | | | | |
| | END OF BORING @ 30' | 30 | | | | | | | | |

*ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

KALAMA VALLEY - MAKAI BRIDGE

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

BRIDGE SITE No. 1

## Boring Log

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10, 15 & 18

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"S - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON
BX - BX DOUBLE TUBE CORE BARREL
AX - AX " " " "

BORING NO. 6 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date NOV. 24 & 26, 1971

Field Party MAESHIRO, MATTES, RADOVICH

Type of Boring AUGER & CORING (ACKER ACE) Diam. 4", BX, & AX

Elev. 67.7' * Datum —

Drill Bit T.C. DRAG & DIAMOND CORING

| Water Level | NOT NOTICED | NOT NOTICED | | | |
|---|---|---|---|---|---|
| Time | — | — | | | |
| Date | 11-24-71 | 11-27-71 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40 | PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 67.7' * | 0 | | | | | | | | | |
| (MH) | MEDIUM, REDDISH BROWN CLAYEY SILT | | 2"S | 6-A | | | | | | | 3/5' 9/5' |
| | LAVA ROCK (PUKA PUKA) | | | | | | | | | | |
| | | 5 | 2"SS | 6-B | — | 30 | — | — | — | | 50/4" |
| | NOV. 24 | | | | | | | | | | |
| | NOV. 26 | 10 | BX | | CORED | | 5.0' | | | | |
| | LAVA ROCK (PUKA PUKA) | | | | RECOV. | | 4.3' | | | | |
| | | | BX | | CORED | | 1.0' | | | | |
| | | | | | RECOV. | | 0.7' | | | | |
| | | 15 | AX | | CORED | | 5.0' | | | | |
| | | | | | RECOV. | | 4.0' | | | | |
| | | 20 | AX | | CORED | | 5.0' | | | | |
| | | | | | RECOV. | | 4.7' | | | | |
| | | 25 | AX | | CORED | | 1.0' | | | | |
| | | | | | RECOV. | | 0.7' | | | | |
| | | | AX | | CORED | | 5.0' | | | | |
| | | | | | RECOV. | | 4.0' | | | | |
| | END OF BORING @ 30' | 30 | | | | | | | | | |

ESTIMATED FTG. DEPTH APPROX. INVERT 5-13-71

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

KALAMA - MAKAI BRIDGE

**WALTER LUM ASSOCIATES, INC.**

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

# Boring Log

BRIDGE SITE No. 1

PROJECT: KALAMA VALLEY OFFSITE IMPROVEMENTS

LOCATION: Maunalua, Oahu, Hawaii

Tax Map Key: 3-9- Por. 10,15 & 18

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
AXM - AXM CORE BARREL

BORING NO. 7 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: DEC. 1, 3 & 4, 1971

Field Party: MEYER, OSHIRO, MAESHIRO, TSUKAZAKI

Type of Boring: AUGER & CORING (ACKER ACE) Diam.: 4" & AXM

Elev.: 68.1' * Datum: ____

Drill Bit: T.C. DRAG & DIAMOND CORING

| | | | | | |
|---|---|---|---|---|---|
| Water Level | NOT NOTICED | NOT NOTICED | | | |
| Time | - | - | | | |
| Date | 12-1-71 | 12-4-71 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Shear P.S.F. | Penetration Data: Standard Penetration Test N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV. = 68.1' * ? | 0 | | | | | | | | |
| (MH) | MEDIUM, REDDISH BROWN CLAYEY SILT W/DECOMPOSED ROCK | | 2"SS | 7-A | - | 14 | - | - | - | |
| | | 5 | AXM | | CORED 4.0' RECOV. 3.2' | | | | | |
| | LAVA ROCK (PUKA PUKA) | | AXM | | CORED 3.0' RECOV. 2.5' | | | | | |
| | | 10 | AXM | | CORED 4.0' RECOV. 3.5' | | | | | |
| | | 15 | AXM | | CORED 1.0' RECOV. 0.8' | | | | | |
| | | | AXM | | CORED 5.0' RECOV. 4.0' | | | | | |
| | LAVA ROCK (PUKA PUKA) W/CINDERS | 20 | AXM | | CORED 5.0' RECOV. 2.5' | | | | | |
| | | 25 | AXM | | CORED 3.0' RECOV. 1.5' | | | | | |
| | CINDER CAVE-IN @ 26' | | | | | | | | | |
| | END OF BORING @ 28' | 30 | | | | | | | | |

DEC. 9 DEC. 1 DEC. 4

ESTIMATED FTG. DEPTH

APPROX. INVERT 5-13-71

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

KALAMA - MAKAI BRIDGE

**WALTER LUM ASSOCIATES, INC.** 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

BRIDGE SITE No.1

## Boring Log

BORING NO. 8 Sheet No. _____ of _____

PROJECT KALAMA VALLEY OFFSITE IMPROVEMENTS Driller W. LUM ASSOC., INC. Date NOV. 29 & 30, DEC. 1, 1971

LOCATION Maunalua, Oahu, Hawaii Field Party MAESHIRO, ASATO, MATTES

Tax Map Key: 3-9- Por. 10, 15 & 18 Type of Boring AUGER & CORING (MOBILE B-30) Diam. 4" & BX

Elev. 68.9' * Datum _____

HAMMER: Drill Bit T.C. DRAG & CARBIDE CORING

Weight 140#

Drop 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON; BX - BX DOUBLE TUBE CORE BARREL

| Water Level | NOT NOTICED | NOT NOTICED | | | |
|---|---|---|---|---|---|
| Time | - | - | | | |
| Date | 11-30-71 | 12-1-71 | | | |

| Unified Soil Classification | DESCRIPTION | Depth (Ft.) | Sampler | Sample No. | Plastic Limit | Water Cont. % | Liquid Limit | Unconf. Comp. P.S.F. | Vane Sheer P.S.F. | PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ELEV.= 68.9' *2 | 0 | | | | | | | | |
| (MH) | MEDIUM, REDDISH BROWN CLAYEY SILT | | 2"SS | B-A | - | 20 | - | - | - | 12/5" 25/1" |
| | NOV. 29 | 5 | | | | | | | | |
| | LAVA ROCK (PUKA-PUKA) | | BX | | CORED 5.0' RECOV. 3.7' | | | | | |
| | NOV. 30 | 10 | | | | | | | | |
| | | | BX | | CORED 4.5' RECOV. 3.5' | | | | | |
| | CAVITY | | | | | | | | | |
| | | 15 | | | | | | | | ESTIMATED FTG. DEPTH |
| | DEC. 1 | | | | | | | | | |
| | CAVITY | | BX | | CORED 5.5' RECOV. 3.5' | | | | | APPROX. INVERT 5-13-71 |
| | | 20 | | | | | | | | |
| | LAVA ROCK (PUKA-PUKA) | | BX | | CORED 4.0' RECOV. 2.0' | | | | | |
| | | 25 | | | | | | | | |
| | | | BX | | CORED 2.5' RECOV. 1.5' | | | | | |
| | | | B-X | | CORED 3.5' RECOV. 3.0' | | | | | |
| | END OF BORING @ 30' | 30 | | | | | | | | |

* ELEVATION ESTIMATED FROM SURVEY STAKE BY PARK ENGINEERING, INC.

NORTH
SC: 1"=80'

APPROX. BOTTOM OF ROCK

OPEN PIT NO. 27

B-27

B-1

OPEN PIT NO. 28

B-28

DARK BROWN "CH" CLAY SURFACE SOILS

"CH" CLAYS AND MIXED SURFACE SOILS

APPROXIMATE OUTLINE OF SURFACE SOIL CHANGES NOTED DURING FIELD OBSERVATIONS

B-30

B-29

B-2

B-31

B-8

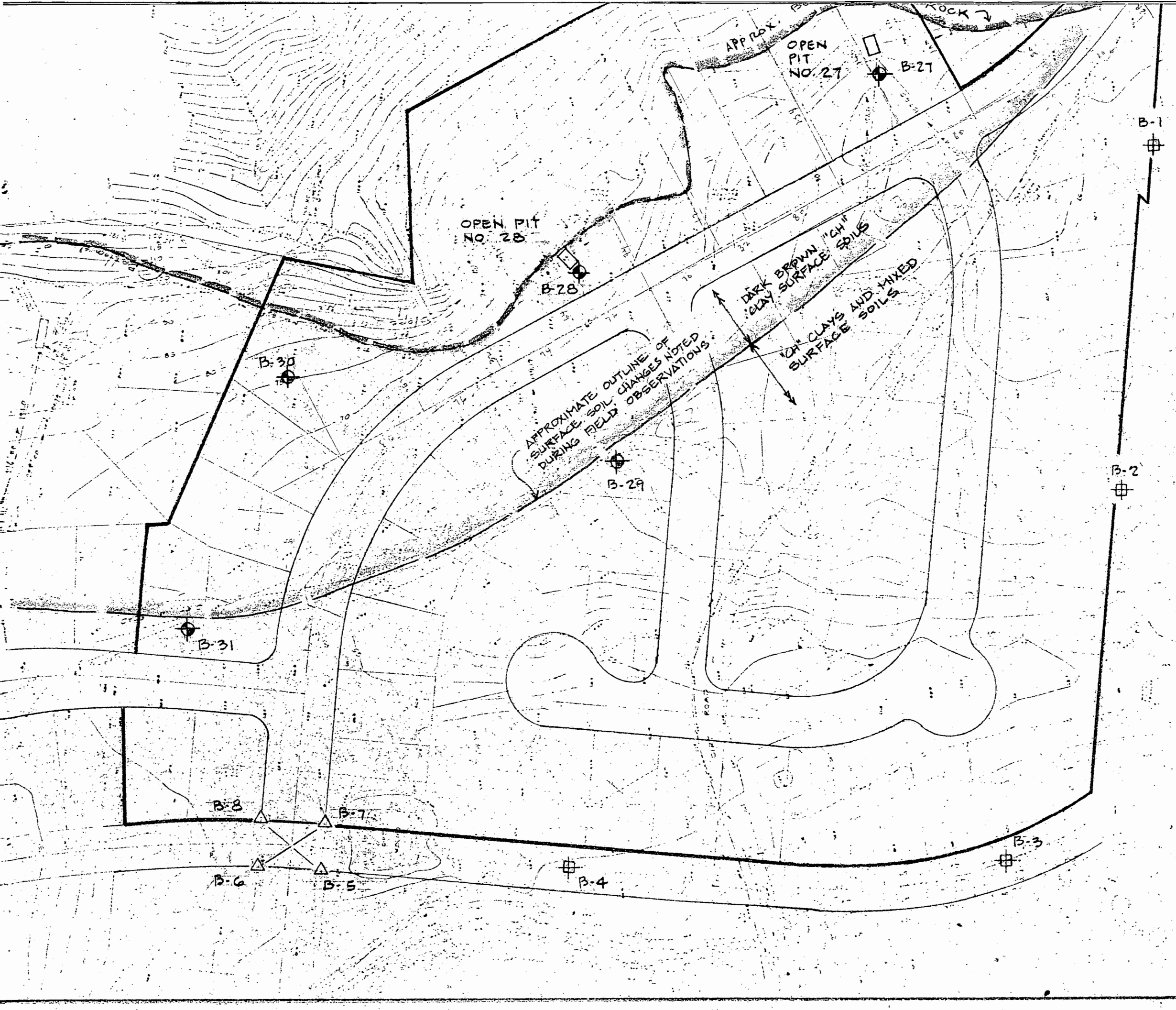
B-7

B-3

## LEGEND

- ⊕ BORING FOR THIS PROJECT
- ⊞ BORING FOR "KALAMA VALLEY OFFSITE IMPROVEMENT".
- △ BORING FOR "BRIDGE SITE NO. 1". DATED DEC. 27, 1972.

BORING LOCATION PLAN
KALAMA VALLEY SUBDIVISION UNIT 2-A



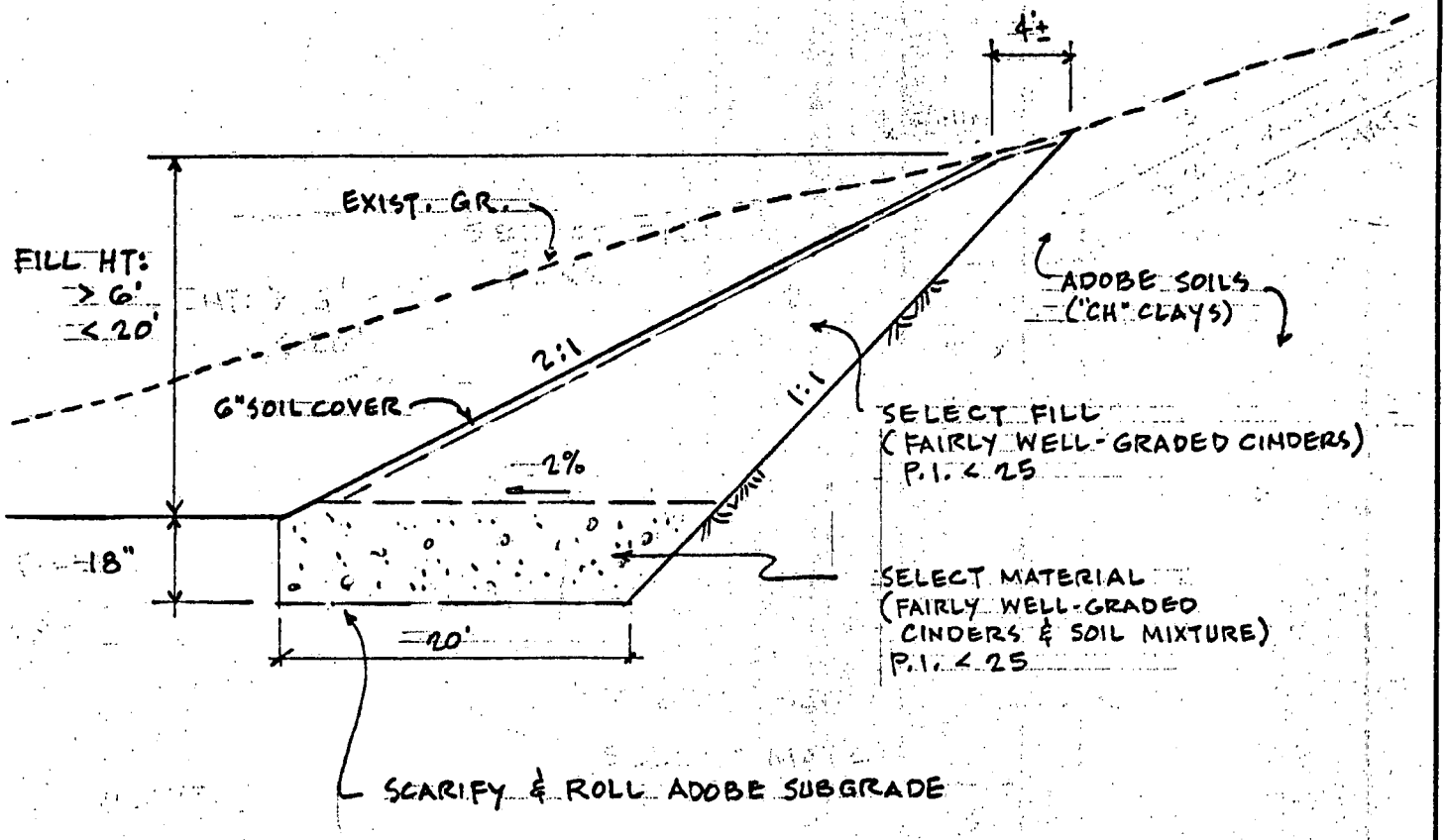

## LEGEND

- ⊕ BORING FOR THIS PROJECT
- ⊞ BORING FOR "KALAMA VALLEY OFFSITE IMPROVEMENT".
- △ BORING FOR "BRIDGE SITE NO. 1". DATED DEC. 27, 1972.

# BORING LOCATION PLAN
## KALAMA VALLEY SUBDIVISION-UNIT 2-A

MAUNALUA, HONOLULU, HAWAII
TAX MAP KEY: 3-9-10: 15 & 18

| | | |
|---|---|---|
| Dr. | WALTER LUM ASSOCIATES, INC. | Sheet |
| Date 3/72 | 3030 WAIALAE AVE. | |
| Rev. | CIVIL ENGINEERS | of |
| | PHONE 737-7931 | |

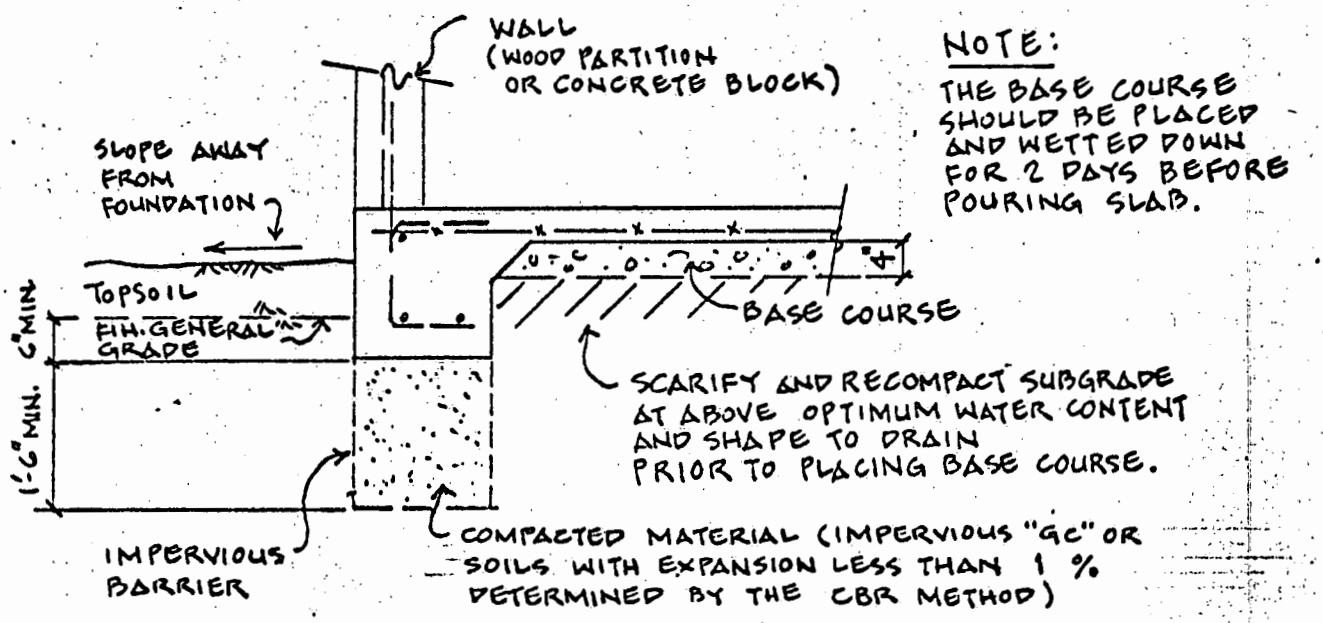



SECTION
NOT TO SCALE

FIGURE 1
PROPOSED SLOPE TREATMENT
FOR CUTS & FILLS IN CLAY ("CH" SOILS)
GREATER THAN 6' IN HEIGHT

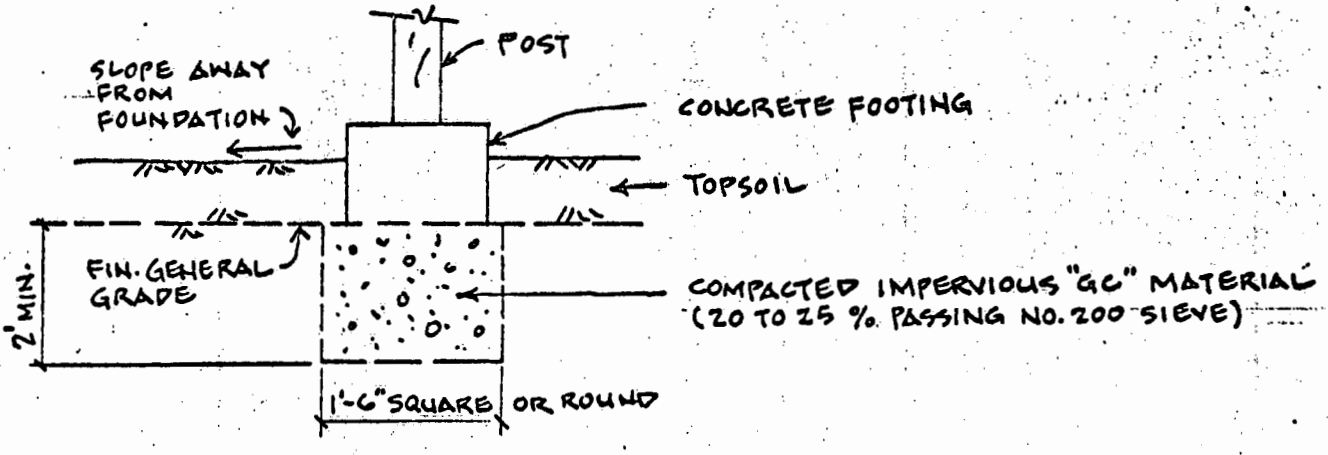
KALAMA VALLEY SUBDIVISION - UNIT 2A
MAUNALUA, HONOLULU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS




NOTE:
THE BASE COURSE SHOULD BE PLACED AND WETTED DOWN FOR 2 DAYS BEFORE POURING SLAB.

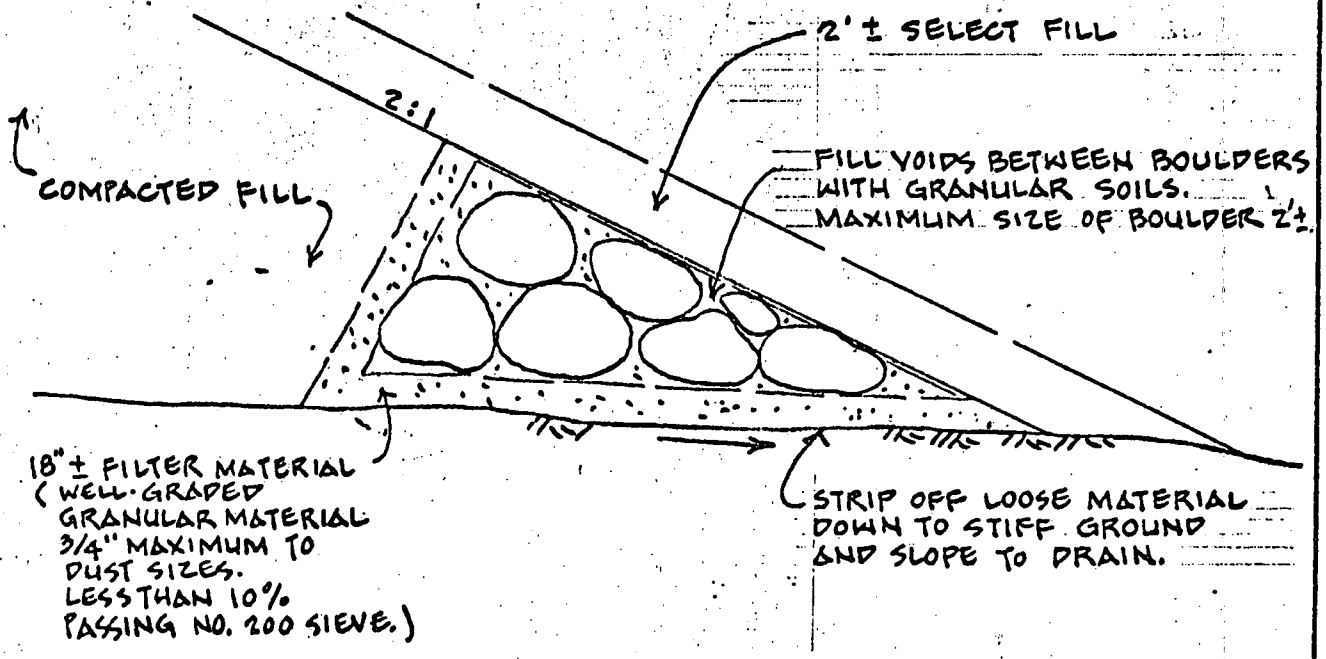
PROPOSED FOOTING FOR SLAB-ON-GROUND ON EXPANSIVE SOIL
NOT TO SCALE




PROPOSED FOOTING FOR POST-AND-BEAM ON EXPANSIVE SOIL
NOT TO SCALE

FIGURE 2
PROPOSED FOOTING DETAILS
FOR LIGHT RESIDENTIAL STRUCTURES
ON EXPANSIVE SOILS
KALAMA VALLEY SUBDIVISION - UNIT 2-A
MAUNALUA, HONOLULU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS




SECTION

NOT TO SCALE

# FIGURE 3

## PROPOSED BOULDER FILL

## KALAMA VALLEY SUBDIVISION-UNIT 2-A

MAUNALUA, HONOLULU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

## LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.